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ROYAL BOTANIC GARDENS, KEW.

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XXIII.—A REVISION OF ISOPYRUM (RANUNCULACEAE) AND ITS NEARER ALLIES.

J. R. Drummond and J. Hutchinson.

The genus *Isopyrum* was established by the elder Linné in 1742 (Genera Plantarum, ed. II. p. 245). The generic description may be rendered into English as follows:—

"*Calyx* none. *Petals* five, ovate, equal, spreading, deciduous. *Nectaries* five, equal, tubular, very short, placed within the corolla: the mouth of each oblique, undivided. *Stamens* indefinite, shorter than the corolla; filaments capillary; anthers simple. *Ovaries* two, ovate; styles simple, as long as the ovary; stigmas obtuse, as long as the stamens. *Fruit* a pair of recurved unilocular, crescent-shaped pods; seeds very many."

A note is added: "Hence neither of the genus Aquilegia nor of Helleborus, much less of Thalictrum.

The above generic description does not fit the actual characters of any of the three species which its author subsequently assigned to his new genus (Species Plantarum, ed. 1753, vol. i. p. 557); and it appears to have been based on the accounts embodied in the works cited, and particularly on Boccone's illustration of *Isopyrum thalictroides* in which the "two legumes" are inaccurately figured.

The character "seeds very many" obviously belongs to *Isopyrum fumarioides*, described in Hortus Upsaliensis in 1747 (p. 157), and the only species represented in the Linnean Herbarium; and this is probably the only one seen by Linnaeus.

Early in 1753 Haller published a criticism of "*Isopyrum fumarioides*, Linn. Upsal. p. 157" in his *Enumeratio Horti et Agri Gottingenensis*, p. 97, remarking that it "belongs, just as Trollius does, to Helleborus":—but he omitted to point out the discrepancy which the Linnean description involved by its combining the "two legumes" of Boccone's plant with the "many seeded" capsules of Amman's description in a single generic character, the "legumes" in the European plant being at most

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three-seeded, while the "polyspermous" follicles of the Siberian weed are usually more than half a score.

Possibly on account of Haller's remark Linnaeus placed his "polyspermous" *Isopyrum fumarioides* in the front rank (in the first edition of the Species Plantarum):—in the next following (fifth) edition of the Genera (No. 621, p. 244), he revised the description of the "Pericarp" as follows, "Capsulae plures lunulatae recurvae uniloculares," though the follicles in *I. fumarioides* are neither definitely "recurved" nor "crescent-shaped"; the "observation" was at the same time modified to "most akin to Helleborus, but very different in habit."

In the sixth (1767) edition of the Genera (p. 282, No. 701) the misleading "semina plurima" reappeared, but Haller again failed to recognise its significance, though, having meantime received specimens of *I. thalictroides* from Jacquin, he noted (1768) in the Historia (ii. 58) that the Austrian plant appeared to differ from the Siberian in character, and recorded certain marks in the European species which certainly support his view.

This state of matters was due to the efforts to identify the original samples of Dioscorides, a task which, as Sprengel points out (Dioscorides ii. 626), was particularly hard in the case of Isopyron—"erutu difficillimum est." Sprengel hazards *Corydalis claviculata*, Persoon—an identification which, as he says, is at least no worse than "Dodoens' hallucination" in favour of the Bogbean (*Menyanthes*). Cesalpini guessed *Lathyrus;* while Fabio Colonna opens his *Phytobasanos* (1592) with an argument supported by a really fine illustration to show that Dioscorides' "flame-like" plant was the familiar Columbine; but, supposing that he was right, Linné was none the less justified in appropriating the name for his new genus, if only as a partial safeguard against Mattioli's device (Comment. p. 328 and 493, ic. 4), who tacked root-leaves of Anise to the stem and flower of a *Nigella*, with the plea that Dioscorides had employed these for comparison with the corresponding parts in *Isopyron.* Colonna's arguments failed to convince Sprengel:—but *Isopyrum*, once it was fixed by Linnaeus in his binomial system, automatically retained its attachment.

Unfortunately it was not furnished with an adequate or certain connotation. In Species Plantarum ed. i. (1753) p. 557, three species are discriminated, the first being *I. fumarioides*, and the second *I. thalictroides*, the latter founded on the *Ranunculus praecox ii thalictrifolio* discovered by Charles de l'Escluse in glades near Vienna and described in the Historia at p. 233 (1601). The history of Linné's third species *I. aquilegioides* is contained in a tract published at Basle in 1776 by Werner de Lachenal, who had traced in the Bauhin Collection the actual specimen which formed the type of *Aquilegia montana flore parvo thalictrifolio* C. B. Prodr. p. 75, as well as a figure of the same, of which he annexed a good engraving to his Dissertation. It proved to be *Aquilegia viscosa*, Gouan. The citation from Bauhin is of course the sole basis of Linné's third supposed *Isopyrum;* Ray simply cited that without comment, and the subsequent confusion rests on Morison, who abbreviated Bauhin's text

and misapplied it to a very poor drawing of a supposed *Aquilegia* borrowed, without acknowledgment, from tab. 8 in the *Pugillus* of Christian Mentzel (Berlin 1682), which could not possibly have been meant for an *Isopyrum*.

In the Systema ed. XII. ii. 372 (1768), Linné repeats the statement as to the number of the seeds in *Isopyrum;* in the second Mantissa (1771) p. 408 he observed that in *Isopyrum thalictroides* there are only three "germens," citing Scopoli, *Flora Carniolica*, ed. i. p. 555 (1760); he omitted, however, Scopoli's further observation that the carpels are one-seeded. Murray and Willdenow, accordingly, in turn reproduced the erroneous definition as regards the number of the ovules. Crantz (*Stirp. Austr.* fasc. ii. p. 125, ed. 1763) criticised Linné's account of *Isopyrum*, with reference, more especially, to the description of the petals ("nectaries"). Gaertner (1788) treated *I. fumarioides* as the type of *Isopyrum* (De Fructibus i. 312 tab. 65 f. 5); and this view has found support from Torrey and Gray (Flora of North America i. Suppl. 660).

It was not until 1839 that a satisfactory definition of *Isopyrum* as a genus* was framed, and this was only attained by separating *I. fumarioides*, on which Spach (Suites à Buffon VII. 326–7) following a note by Reichenbach in the Flora Germanica Excursoria (1832) p. 747, founded the new genus *Leptopyrum*, and it seems preferable to regard the genus *Isopyrum* as subsisting on the authority of Spach following Reichenbach. This constitutes *I. thalictroides*, Linn. Sp. Pl. i. 557 (1753) the type of *Isopyrum*, and excludes such allied forms as do not exhibit the characters of that genus as amended in the *Histoire Naturelle des Vegetaux* (Paris 1839) vii. p. 326.

Bentham and Hooker in *Genera Plantarum* vol. i. p. 8 (1862) amended the description of the genus with respect to the number of the ovules. They estimated the content of *Isopyrum* at seven species, and in the Index Kewensis to date there are thirty-two valid specific names.

The first addition to the Linnean species of *Isopyrum* was published by Alphonse de Candolle in the *Systema*, i. p. 324 (1818), as *I. adoxoides*, based on Plukenet's figure 3. t. 360 Amaltheum, page 19 of text (1705), a species found in the island of Chusan by James Cuninghame. Cuninghame's collections are preserved in the Sloane Herbarium, at the Natural History Museum. Plukenet's type is on p. 151 of vol. xciv.; duplicates on pages 83 and 100 of vol. xx.; all three correspond quite clearly to the Amaltheum illustration and De Candolle's description.

This species has a varying number of the inner row of stamens converted into scales or staminodes, a condition which is characteristic of the genus *Aquilegia*, but has not been observed in

* Previously in *Conspectus Regni Vegetabilis*, No. 4954 (Leipzig 1828) but without note or description:—also *Icones Florae Germanicae* iii. 26 t. cxiii. fig. 4728 & 4728 (b), publ. 1840. In the *Dictionnaire Classique* vol. ix. p. 34 (1826) A. Richard had originally pointed out the propriety of dividing the Linnean genus, but he assigned *Isopyrum* to *I. fumarioides*, and proposed a new genus, *Thalictrella*, for *I. thalictroides*:—in 1830 (vol. xvi. p. 204) he cancelled *Thalictrella*.

Leptopyrum, nor in any of the other species placed by the earlier botanists under *Isopyrum*, and has accordingly been made the type of a separate genus, *Semiaquilegia*, by Makino, Bot. Mag. Tokyo xxi. (1902) p. 119.

In addition to the three species described by De Candolle under *Isopyrum*, the *Systema* includes at p. 337 a species named by Willdenow (Mag. Gesellsch. Naturf. Freund. Berlin, 1811, p. 401. t. 9 f. 6), *Aquilegia anemonoides*. The early history of this graceful plant is somewhat obscure; in the *Flora Altaica* (1830) Ledebour mentions Gebler as the collector, but in the *Flora Rossica* (1842) vol. i. 53 this is corrected, and priority given to the elder Schangin,* with a Latin version of Schangin's appreciation of the "beautiful dwarf Columbine," which his Journals (in Pallas, Nordische Beitrage vi. 55 publ. 1793) show him to have discovered on "inaccessible" ledges at the head-waters of the Korgon, an affluent of the Irtish in the Western Altai.

The same species is stated by Ledebour (Flora Ross. i. 53) to have been in Stephan's herbarium, named in manuscript as "Aquilegia minuta." It was communicated by Fischer probably to Willdenow, who referred it to *Aquilegia*. Fischer, however, placed the species in *Isopyrum*, and it was published (1824) in the Prodromus i. 48 as *Isopyrum grandiflorum*, Fisch. in litt., although on p. 51 of the same work he included "Aquilegia anemonoides" on the authority of Willdenow. A note by Bentham in his interleaved copy of the Prodromus, now at Kew, shows that in 1828† Arnott elicited from Fischer that his *Isopyrum grandiflorum* and Willdenow's "Aquilegia anemonoides" were one and the same thing. Accordingly in the *Flora Altaica* (Berlin 1830) vol. ii. p. 299, Ledebour included *I. grandiflorum*.

De Candolle, following A. L. de Jussieu, Gen. Plant. (1789) p. 233, improved the definition of the genus *Isopyrum*, treating in the *Systema* (i. 323) the "nectaries" as petals, and the "petals" of the older botanists as sepals, and providing a sufficient line of division as against *Helleborus* in the deciduous sepals of *Isopyrum*.

Prain‡ has demonstrated, for the *Papaveraceae*, the difficulties that beset any attempt to limit the genera in these Thalamifloral families on a practical basis, and this applies with at least equal force to the *Ranunculaceae*. To take an example, no phyletic theory could stand which fails to account for the obvious parallels in general morphology of certain species linked with *Isopyrum thalictroides* and the genus *Thalictrum*, but at the same time it is impracticable to frame any arrangement of the family, as a

* Peter Ivanovich Schangin, an officer of the Department of Mines; eminently skilled in the geology and especially petrology of the time; a keen student of natural history, and a good botanist; in 1786 he conducted an exploration ot the Altai Mts. primarily in search of lapis lazuli quarries; his report includes a masterly account of the geography and mineralogy of the upper Irtish basin, with full and highly interesting notes on the Flora.

† Attention had probably been aroused by the appearance of Sprengel's *Systema* vol. ii. (1825), which included both 'Isopyrum grandiflorum, Fisch. Cand.', and 'Aquilegia anemonoides, W.'

‡ Noviciae Indicae, pp. 105–129.

whole, without recognising the importance that attaches to the follicular, as opposed to the achenial character of the mature carpel. Now in *Isopyrum grandiflorum* and its closer allies, the mature follicles are manifestly more akin in structure and development to those of *Aquilegia* than to *Isopyrum thalictroides*, or—to take another example of the same series—to *Isopyrum adiantifolium*, and after weighing all the conditions we have found ourselves obliged to propose a fresh* genus for these Central Asian perennials (*i.e.*, for the *grandiflorum group*), to which we have given the name of *Paraquilegia*.

In the Prodromus (i. p. 48) De Candolle admitted though not without question the genus *Enemion*, founded on a species—not unlike the Wood Anemone of Europe,—which is plentiful in woods in the United States of America. The first scientific observer of this plant, often associated with *Syndesmon thalictroides*, Hoffmans., and gathered with it, was Dr. Short, of Lexington, Kentucky, who in 1820 sent to Sir William Hooker specimens now in the Kew Herbarium, contending that these were identical with *Isopyrum thalictroides*, Linn., of Europe, of which Hooker at first thought it might prove to be an apetalous form. Relying mainly on the absence of petals Rafinesque, in *Journal de Physique* (De Blainville) Tom. xci. pt. 2, p. 70 (1821) constituted *Enemion*. In Hook. Journ. Bot. i. 187 (1834) a brief notice of Short's specimens was intercalated in a summary of Thomas Drummond's Louisiana collections without formal description; in 1840 (Bot. Beech. Voy. Suppl. 326) a second apetalous species, discovered by Douglas about 1830 in California, was described by Hooker and Arnott as *Isopyrum occidentale*. In the same year in their *Flora of North America* (vol. i. Suppl. 160) Torrey and Gray, while accepting Hooker's reduction of *Enemion*, established the independence as a species of *Isopyrum biternatum* (*Enemion biternatum*, Rafinesque) as against Short's theory of its being merely a "geographical form" of the European *I. thalictroides*. Three species of the same type as *I. occidentale* have since been discovered, two American and one from North-East Asia, all from the North Pacific region. *Enemion*, therefore, must be held to have justified its author's discrimination. It is a fairly "natural" genus, in the accepted sense, more so than *Semiaquilegia*, where there is conspicuous diversity of habit between Makino's type and certain of the species which we have been led to include along with it, as they also exhibit the essential character—the conversion into scales of some of the inner stamens. *Semiaquilegia adoxoides* approaches *Paraquilegia* in general appearance and has moreover very few staminodes, whilst *S. simulatrix*, on the other hand, is in general appearance so absolutely a Columbine that it was described by Maximowicz, Fl. Tangut. (1889) p. 20, t. 8, f. 12, as *Aquilegia ecalcarata*, but apart from the staminodes, the petal-spur† characteristic of *Aquilegia*

* cf. Spach, Suites (as above) p. 327.

† One modern view regards the so-called 'petals' of these *Helleboreae* as "highly modified staminodes"; cf. Prantl. in Pflanzenfamilien iii. (2) p. 49 also E. B. Payson in Contrib. United States Nat. Herb. xx. (4) 135, n. 1 (1918.)

is represented by a mere pouch. *Semiaquilegia*, therefore, forms an important landmark from the phyletic standpoint in that it indicates the origin of *Aquilegia*. One species, *S. Henryi*, points in its vegetative characters rather to *Enemion* or even to *Coptis*.

Aquilegia Jonesii, Parry in Amer. Nat. viii. 211 (1874), a native of the Northern Rocky Mountains, illustrates the intricacy of these intergeneric relations very clearly; the floral whorls are manifestly those of *Aquilegia*, and although the general habit is diverse from the majority of Columbines, it is approached in *A. nivalis*, Falconer, while the foliage and shrubby lower stem are just as characteristically those of *Paraquilegia*.

At pp. 54–55 of the *Illustrations*, Royle has described two species from Upper Kanawar, and depicted them in figs. 3 and 4 on Plate 11, as *Isopyrum grandiflorum* and *Isopyrum microphyllum* respectively. Royle's figure 3 seems to approach *I. caespitosum* of Boissier and Hohenacker, Diagnoses ser. (1) fasc. viii. 7 (1849), of which we have seen an authentic specimen at the Natural History Museum.

In deference to the authority of Maximowicz and of Franchet we have retained the three species just mentioned, although after close examination of a large suite of specimens we are unable to distinguish them satisfactorily in the Herbarium.

With these, which are all of a habit peculiarly adapted to the inhospitable spots in which they grow, we have associated a fourth, which in general appearance inclines towards *Isopyrum* proper, but in the form and arrangement of the follicles to *Leptopyrum*. This extends to the Tian Shan—the inner Himalaya in Western Kashmir and the Chenab basin—also to the Suliman Range at high elevations, from the Alatau, where it was discovered in 1841 by Karelin and Kiriloff,* and described by them in Bull. Soc. Nat. Mosc. xv. 135 (1842) as "*Isopyrum anemonoides*": this name being open to objection, we have exchanged it for *(Paraquilegia) uniflora* given (under *Isopyrum*) by Hemsley to Afghanistan specimens (Journ. Linn. Soc. xix. p. 149 publ. 1882).

Paraquilegia is essentially a Central Asian type; even *P. microphylla*, which has by far the widest range of the three shrubby forms, is not found much to the south of the watershed that divides the dry elevated inner valleys skirting the main Asiatic plateau from the monsoon-affected areas of India;—the centre of dispersion seems to have been in the "massif" between the Tian Shan and the basin of the upper Irtish, reaching along the Sayan and connected ranges into eastern Siberia on the one hand, and southwards across the Hindu Kush and the Himalaya to the Alps of Afghanistan and eastern Persia. The rather abrupt diversity of the solitary European type of *Isopyrum* from its allies in the Far East on the one hand, and from *Paraquilegia* on the other, suggests that the absence of these types from the Caucasus and the Ural Mountains may be due to extinction of

* Succeeded Kusnetsoff—who succumbed after a journey to the Okhotsk Sea—as collector for Turczaninow. Numerous gatherings by Kiriloff, and a few by Kusnetsoff, are in the Hookerian Herbarium at Kew.

intermediate forms, following on climatic changes in those regions. Pampanini (see Fiori, A. Beguinot and R. Pampanini, note on No. 449 *Flora Italica Exsiccata*) believes that *Isopyrum thalictroides* escaped in South Europe the furthest incursion of the Polar ice-sheet, and after the last main recession migrated for the second time into Central Europe.

Leptopyrum, which is annual and has yellow sepals, may have originated in the course of post-glacial fluctuations; from observations by Pallas (*Reise* iii. 318) its headquarters were restricted so recently as 1772, to the sub-alpine tract south of Lake Baical, though it was found more sparingly in various localities at lower levels; like *Fumaria* and *Hypecoum*, which it resembles in its foliage, it has no doubt spread rapidly with extending cultivation.

Enemion is a "natural" group of forms, and its distribution strongly confirms the morphological evidence. The species greatly resemble *Anemone nemorosa* in their foliage and habit. The single Asiatic species was discovered by Radde in the Bureya Mountains, flanking the Amur east of Blagoveshchensk, and was figured and described by Regel (Aufzählung, 1861, p. 61, tab. ii. fig. 3, 4, f, g.). From Franchet and Savatier (Enum. Pl. Jap. Addenda, 1876, p. 270) it appears that *E. Raddeanum* (*i.e.* Regel's plant just mentioned), or a very closely allied species, extends to Japan, but we have seen no specimens from there. This North Pacific region is the home now of the most numerous section of *Isopyrum* as defined in this paper.

In 1883 Maximowicz published a revision of *Isopyrum* (Bull. Acad. Sc. St. Petersb. xi. 623–642); in this he treated *Enemion* as a section merely, and did not discuss the validity of *Leptopyrum*. In addition to the four species placed by us under *Paraquilegia*, plus the European *I. thalictroides*, *I. adiantifolium*, Hook. fil. and T. Thoms. (1855), *I. dicarpon*, Miquel (1867) and *I. adoxides*, DC. (= *Semiaquilegia*, Makino), he admitted the following: *I. nipponicum*, Franchet (1879), *I. anemonoides*, Kar. et Kir. (1842) which we unite with *Paraquilegia uniflora*, *I.* (*Enemion*) *stipitatum*, A. Gray (1876), *I.* (*Enemion*) *Hallii*, A. Gray (1872), *I.* (*Enemion*) *occidentale*, Hook. and Arn. (1840) and *I.* (*Enemion*) *biternatum*, Torrey and Gray (1840); at the same time he added two new species, viz. *I. stoloniferum* (= *I. dicarpon*, Franch. et Savat. Enum. Pl. Japon. ii. 271 (1884), and *I. trachyspermum* (= *I. dicarpon*, S. L. Moore in Journ. Bot. 1878, p. 129)—in either case not the *I. dicarpon* of Miquel.

The next revision was by Franchet in Journ. Bot. Morot. xi. (1897) pp. 187, etc.:—in this he confined his attention to what he regarded as the "Oriental" region, thus excluding eight of the species in Maximowicz' enumeration, *i.e.* the four American, referred by us to *Enemion*, the European *I. thalictroides*, *I. uniflorum* ("anemonoides") and *I. caespitosum* of West Asia, also *I. adiantifolium*, hitherto recorded from Sikkim only, but reported lately from North Burma as well. Franchet's revision included the following:—*I. auriculatum*, Franchet, *I. Henryi*, Oliver, *I. peltatum*, Franchet, *I. vaginatum*, Maximowicz, *I. Fargesii*, Franch., *I. Faurieii*, Franch., *I. sutchuenense*, Franch., *I. Delavayi*, Franch.

In 1898 fruiting material of *I. vaginatum*, Maxim., from Abbe Delavay's collections came into Franchet's hands, and he accordingly, taking into account all the observed characters, established the new genus *Souliea* for the reception of this very peculiar species, which approaches *Cimicifuga* (see page 167).

The latest revision is by Finet and Gagnepain (*Flore d'Asie Orientale*, in Bull. Soc. Bot. Fr. ser. 4, Tom. iv. 402–409, publ. 1904). Their classification is based, unfortunately as we think, on characters taken almost exclusively from the petals; but *Enemion* is not considered. *Leptopyrum* is ignored; *Souliea* is recognised; *Semiaquilegia*, published during 1902, is passed over, but *Isopyrum Henryi*, Oliver, is transferred to *Aquilegia*, "Isopyrum peltatum" is accepted without question, although it breaks down the highly practical distinction set up between the subtribes *Caltheae* and *Isopyreae* by Bentham and Hooker (Genera Plantarum, i. p. 2), and is otherwise almost as obviously out of its affinity as "*I. vaginatum*." Franchet's *I. sutchuenense* is reduced to *I. adiantifolium*, Hook. fil. and T. Thoms.; *I. trachyspernum*, Maxim., is omitted, and, while "*I. anemonoides* Kar. and Kir." is retained as a good species, *I. uniflorum*, Hemsley and Aitchison, which is certainly the same thing, is treated as a variety of *I. grandiflorum*, which suggests that the authors must in this instance have had somewhat inadequate material before them. Otherwise their arrangement is substantially that of Franchet with an important series of corrections as regards *I. auriculatum* and *I. Delavayi*. *I. Delavayi*, which was founded on Delavay No. 4920 (bis) is, as they have pointed out, merely a state of the original *I. auriculatum*, Franch., the latter founded on No. 2095 Ducloux from Tchenfongchang and No. 4951 Delavay from Longki in Yunnan, whereas *I. auriculatum*, Franchet in Journ. Bot. Morot, xi. (1897) p. 220, (nec Franchet in Bull. Soc. Bot. Fr. xxxiii. ut supra) is a distinct species which they have duly described as *I. Franchetii* = No. 5094 Delavay, also collected in the Longki neighbourhood.

The geographical distribution of the genera dealt with in this paper, excluding *Asteropyrum*, may be summed up as follows:—(1) *Paraquilegia*:—one variable species in the Alps of Northern Asia and China, the Inner Himalaya, Eastern Afghanistan and North-Eastern Persia; a second restricted to the loftier ranges of North-Western Asia, the Western Himalaya, and Eastern Afghanistan:—if *P. microphylla* and *P. caespitosa* are ranked as distinct species, then *P. grandiflora* is restricted to the Western Alps of Central Asia and India, and *P. caespitosa* to West Asia with the North-Western Himalaya; *P. microphylla* being absent west of the Indus and the Oxus respectively.

(2) *Leptopyrum*:—one annual species, originally subalpine in the mountains south of Lake Baical, now diffused as a weed of cultivation at lower levels throughout Northern Asia.

(3) *Isopyrum*:—species 12; one in Central and South-Eastern Europe at moderate elevations; a second in the Eastern Himalaya; the remainder—of rather local occurrence in some cases—in Japan, Formosa, Southern Central and North-Western China, also in Yunnan.

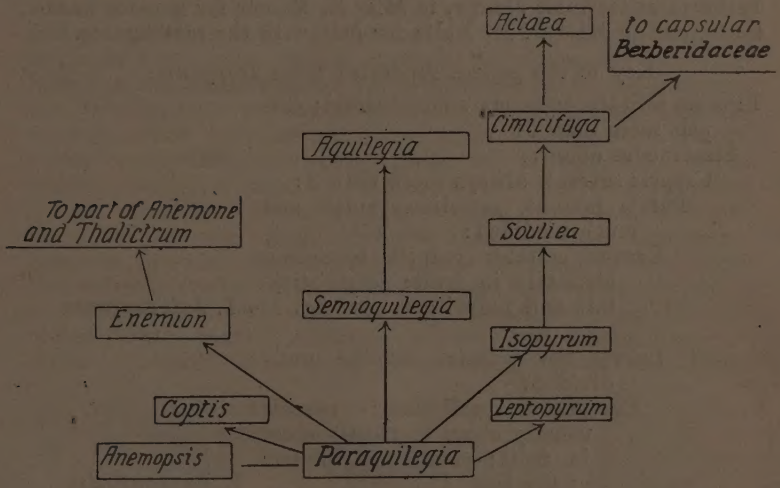
(4) *Semiaquilegia*:—species 4; one in Japan, Chusan and South-east China; two in Central China; one in North-Eastern America—the American form differs from *Aquilegia* in the reduction of the petal-spur solely.

(5) *Enemion*:—species 5; one in N.E. Asia and Japan; the rest in N.W. America.

(6) *Souliea*:—a single species, recorded from Kansu, Szechuan and Yunnan.

Pending further study of the living plants, and particularly of ripe seeds which seem often not to be perfected, we have not attempted to indicate the exact distribution of the *grandiflora* group of species of *Paraquilegia;* the exsiccata have been placed under one or other of the types recognised by Maximowicz to the best of our ability, but with great diffidence. Except where otherwise stated the specimens quoted have been examined by us.

Our views on the probable phylogeny of this group may be shown as follows:—



Paraquilegia seems to present the more primitive features of the group, and it probably gave rise to most of the other genera dealt with in the present paper. For instance there is quite an easy transition from *Paraquilegia* to *Semiaquilegia*, with *saccate* petals, the only remaining link showing the origin of the remarkable genus *Aquilegia*, which, as evidenced by the great variability of its species and its wide range, is probably still in a state of flux. It is extremely doubtful whether this line of development proceeded any further than *Aquilegia*. Then *Paraquilegia* seems to indicate the starting point for another line of development, *i.e.*, in the reduction of the number of carpels to two, as in *Isopyrum*, and at length to one accompanied in the latter case by aggregation of the flowers into racemes resulting in the genera *Souliea* (fig. 8), *Cimicifuga* and *Actaea*, which in their turn may have been the progenitors of certain herbaceous *Berberidaceae* (for instance *Epimedium*).

The genus *Souliea*, separated from *Isopyrum* by Franchet, forms the bridge between *Paraquilegia* and the *Cimicifugeae*, and of the latter an extreme reduction may be the remarkable genus *Achlys* in *Berberidaceae*, which has the inflorescence of *Cimicifugeae*, but has no perianth. Then again the genus *Enemion* seems to be a direct offshoot from *Paraquilegia*, the divergence here being the entire reduction of petals and the tendency to an umbellate arrangement of the flowers. The remarkably close affinity of two species of this genus, *E. Raddeanum* from Manchuria, and *E. Hallii* from Oregon, is worthy of note.

Asteropyrum (fig. 1), a genus described below for the first time, is not shown in the phylogenetic table above because its true position seems to be in the neighbourhood of *Caltha* and *Trollius*.

We are much indebted to Professor Bayley Balfour and Dr. A. B. Rendle for allowing us to examine the material in the herbaria under their charge, to Miss E. Milner for general assistance, and to Miss D. M. Rolfe for help with the text figures.

Key to the genera separated from *Isopyrum*.

Flowers solitary or rarely subumbellate; carpels more than 1:	
Staminodes absent:	
Carpels several, always more than 2:	
Petals present, sometimes small and much modified:	
Leaves peltate; carpels spreading stellately in fruit; petals stipitate and indusiform (see fig. 1)	1. **Asteropyrum** (gen. nov.)
Leaves not peltate, usually much divided:	
Caespitose perennials; carpels usually about 5, mostly erect in fruit; petals not tubular at the base	2. **Paraquilegia** (gen. nov.)
Annuals; carpels about 12 or more; petals tubular at the base	3. **Leptopyrum,** *Reichb.*
Petals absent; inflorescence often umbellate	4. **Enemion,** *Raf.*
Carpels 2 (rarely 3), divaricate in fruit; perennials	5. **Isopyrum,** *L.*
Staminodes membranous and flat within the fertile stamens; petals saccate at the base	6. **Semiaquilegia,** *Mak.*
Flowers several in short racemes; leaves vaginate at the base; carpel 1	7. **Souliea,** *Franch.*

Asteropyrum, *nobis,* genus novum foliis peltatis petalis longe stipitatis indusiaeformibus carpellis numerosis demum stellato-patentibus distinctum. Ob folia peltata in subtribum Calthearum removendum est, nisi characteres subtribium secus Genera Plantarum (Benth. et Hook. f.) mutentur; follicula eis Trollii omnino simillia videntur.

Species 2, chinenses.

Folia haud vel leviter lobata	1. *A. peltatum.*
Folia profunde 3–5-lobata, lobis triangularibus acutis...	2. *A. Cavaleriei.*

1. **Asteropyrum peltatum,** *nobis,* comb. nov.

Isopyrum peltatum, Franch. Pl. David. ii. 8, t. 4. (1888).

Descr. emend.—*Rhizoma* abbreviatum, radicibus exiguis pilis rufis minutis. *Folia* omnia radicalia, longe petiolata, peltata, ambitu obtuse subpentagona vel suborbicularia, undulate lobata et dupliciter crenulata vel denticulata, 2–4·5 cm. diametro, chartacea, obscure nervosa, supra marginem versus subappresse setuloso-pubescentia, infra glabrescentia; petioli parum carnosi, usque ad 9 cm. longi, basi in auriculas membranaceas suborbiculares purpurascentes dilatati, parce retrorsum pilosi, purpurascentes. Pedunculi e rhizomate orti, solitarii vel plures, simplices vel rare biflori, foliis aequilongi vel multo longiores, fere glabri, apices versus bracteis approximatis vel alternantibus ovatis obtusis circiter 4 mm. longis instructi. *Flos* albus, circiter 1·3 cm. expansus. *Sepala* late obovata, apice rotundata, 5–7 mm. longa, 3·5–4·5 mm. lata, distincte 5-nervia, sicco fere membranacea, glabra. *Petala* quam sepala dimidio breviora, stipitato-indusiaeformia, circiter 3 mm. longa. *Stamina* petalis paullo longiora; antherae 1 mm. longae. *Carpella* circiter 10, sub anthesi erecti, matura stellatim patentia, subcoriacea, vix reticulata vel rugosa, demum obscure torulosa, circiter 8 mm. longa

Fig. 1.—Asteropyrum peltatum (whole plant ½ nat. size); dissections enlarged.

et 2·5 mm. lata, in stylum subtriquetrum circiter 2 mm. longum rectum plus minusve producta, stigmate obscuro minute bifido. *Semina* ellipsoidea, 1·5 mm. longa, castanea, obscurissime striata, margine subcarinata.

China. Szechuan: South Wushan, *A. Henry*, 5630. Han-kyse, near Tchen-Kiou, 1400 m., 2 Apr. 1896, *R. P. Farges* 1148. Western Hupeh: fls. white, moist rocks, 1350–2100 m., *E. H. Wilson* (Veitch Exped.) 3078; without definite locality, *E. H. Wilson* (Veitch Exped.) 1849; (Arn. Arb. Exped.) 2369; mossy places in forests at Fang Hsien, 2400–2850 m., 16 May, 1907, *E. H. Wilson* (Arn. Arb. Exped.) 3311.

2. **Asteropyrum Cavaleriei,** *nobis*, comb. nov.

Isopyrum Cavaleriei, Leveille et Vaniot in Bull. Soc. Bot. Fr. li. 289 (1904).

China. Kweichow: Pinsa, by waterfalls, 11 Mar. 1902, *Cavalerie* 1345; without locality, *Lesquirol* 436 (Herb. Edinb.).

Paraquilegia, *nobis*, genus novum habitu dense caespitosum foliis 2–3-ternatisectis petalis sessilibus suborbicularibus basi concavis apice plus minusve profunde emarginatis carpellis plerumque 5–7 erectis vel rare demum patulis seminibus carinatis vel anguste alatis nitidis distinctum.—*Isopyrum*, Auct. partim.

Species 4, e montibus altioribus Asiae Centralis usque ad Siberiam orientalem, Persiae, et Affghaniae, Emodi interioris et Sinae occidentalis.

Carpella fructu plus minusve erecta; caules caespitosi, rigidi:
- Folia glabra, 2–3-ternatisecta; flores speciosi, circiter 2–3 cm. diametro:
  - Semina puberula ... ... 1. *P. grandiflora.*
  - Semina glabra ... ... 2. *P. microphylla.*
- Folia minute puberula, plerumque simpliciter trifoliolata; flores satis minores 3. *P. caespitosa.*

Carpella fructu patula; caules graciles decumbentes, solitarii vel pauci ... ... 4. *P. uniflora.*

1. **Paraquilegia grandiflora,** *nobis*, comb. nov.

Isopyrum grandiflorum, Fisch. ex DC. Prodr. i. 48 (1824); Maxim. in Bull. Acad. Sci. St. Peters. xi. 627 (1883). *I. grandiflorum*, var. *songarica*, Trautv. in Bull. Soc. Nat. Mosc. 1866, 2. *Aquilegia anemonoides*, Willd. in Mag. Ges. Naturf. Fr. v. 401, t. 9, fig. 6.

Central Asia. South Siberia: Alps of Lake Baical, 1830, *Turczaninow*. Altai, *Herb. Prescott*. Turkestan: *Socalski* 122. Ili, *Krassnoff*.

China. Western Kansu: Tangut country, 1892, *Przewalski*. Nan Shan, 1879, *Przewalski*.

The following specimens appear to be assignable to this species on the characters relied upon by Maximowicz:—

China. Western Kansu: Lien-wha-shan, 3500–3800 m., *Purdom* 737.

India. Kumaon: Topidhunga, 5000 m., *Strachey and Winterbottom*. Garhwal: Niti Pass, 5000 m., *Madden* 3070 (Herb. Edinb.). Kunawar, *Jacquemont* 711. Piti, *T. Thomson*. Lahul, *Jaeschke* 155. Sauch Pass, *Ellis* 1638. Kashmir: *Duthie* 13218; 13760; 25460; *Sahni* 273; *J. R. Drummond* 14223. Kurrum: Mt. Sikaram, 4100 m., *Aitchison* 207. Baltistan, *Duthie* 11897 (Herb. Mus. Brit. and Edinb.). Hazara, *Duthie* 20727.

2. **Paraquilegia microphylla,** *nobis*, comb. nov.
Isopyrum microphyllum, Royle, Ill. 54, t.l. fig. 4 (1839).

Central Asia. South Siberia: Alps of Lake Baical, 1830, *Turczaninow*. Balachte, 1834, *Kuznetsoff*. E. Siberia, *Stubendorff*. Saiansk Mts., *Augustanioff*. Alatau Mts., *Karelin and Kiriloff* 1161.

China. Thibet: *Przewalski* (1884). Kigichu Valley, 15 miles east of Lhassa, Sept. 1904, *Walton*. Mongolia: mts. around Lake Ubsa, 1879, *Potanin*. Western Szechuan: Tatsienlu, *Soulié* 117, 834. Yunnan: Mekong-Yangtse and Mekong-Salween divides, *Kingdon-Ward* 430, 510, 581; *Forrest* 16759; Tsekou, *Soulié* 1040; mountains near Chungtien, 4100 m., Aug. 1914, *C. K. Schneider* 2393. Mupin, 2200–2400 m., *E. H. Wilson* (Arn. Arb. Exped.) 3313. Lichiang Range, *Forrest* 5099, 5722, 10301.

Fig. 2.—Paraquilegia microphylla (⅔ nat. size).

India. Sikkim: Naku La, *Younghusband* 220. Llonok, 5400 m., Jan. 1909, *Smith and Cave* 2313. Kumaon: Pindari, 4200 m., *Strachey and Winterbottom;* J. L. Stewart 712; *Herb. Falconer* (Kew Distrib. 54). Garhwal: *Madden* 3053 (Herb. Edinb.). Sources of the Janma, *Jacquemont* 712. Nila Valley, *Duthie* 746. *Hangorang Pass,* 4200 m., *J. R. Drummond* 4340. Kanawar, *Munro* 27; *Watt* 13669 (Herb. Edinb.). Hamta Pass, Kulu, 4200 m., *J. R. Drummond* 8318. Sauch Pass, 4200 m., *Lace* 1615. Laka, *Edgeworth.* Above Rotang Pass, Kulu, 4800 m., *Herb. J. R. Drummond* 8314. Kelang, Lahoul, *Watt* 2496 (Herb. Edinb.). Hazara, *Duthie* 19104, and several other unnumbered gatherings.

3. **Paraquilegia caespitosa,** *nobis,* comb. nov.

Isopyrum caespitosum, Boiss. et Hoh. Diagn. Ser. i. viii. 7 (1849); Boiss. Fl. Or. i. 64 (1867).

Persia. Mt. Elbrus, 3500 m., 11 July, 1843, *Kotschy* 501 (type).

Afghanistan. Suliman Mts., *Aitchison* 121.

Turkestan. By Lake Kuli-Kalon, 2800 m., *Komaroff.*

India. Kashmir: near Daranshi Camp, 3620 m., *Conway* 45, 46. Deosir, *Falconer* 2872. Baltistan, *Falconer* 3653. Saskatti Pass, *J. R. Drummond* 14223 A.

4. **Paraquilegia uniflora,** *nobis,* comb. nov.

Isopyrum anemonoides, Kar. et Ker. Enum. Pl. Songor, n. 55 (1842), non *Aquilegia anemonoides,* Willd. in Mag. Ges. Naturf. Fr. v. 401, t. 9, fig. quae = **Paraquilegia grandiflora,** *nobis;* Maxim. Mel. Biol. xi. 633 (1883). *Isopyrum uniflorum,* Aitch. et Hemsl. in Journ. Linn. Soc. xix. 149 (1875).

Turkestan. Alatau Mts., at the sources of the Lepsa and Sarchan, rare, *Karelin and Kiriloff* 1162; without definite locality, *Fedschenko.* Lake Kuli-Kalon, 3000 m., *Komarov.* Margusar-kul, 2000 m., *Komarov.* Djidjik, 2250 m., *Komarov.* Voru River, 2400 m., *Komarov.* Pasrud and Pinchon, 2250 m., *Komarov.* Tian Shan, *Osten Sacken.* Semirechensk District, *Socalski* 258. Zamma River, *Przewalski.* Pamir, *Kuschakewicz.*

Afghanistan. Kohl Baba, 4500–4700 m., *Griffith* (Kew Distrib. 39). Seratigah, 4200 m., 1879, *Aitchison.*

China. Sinking: Tian Shan Mts., at the source of the Zanma, *Przewalski* (1877). Kansu, *Przewalski* (1880).

India. N.W. Provinces: Safed Koh Range, Shendtoi Valley, 3000 m., *Aitchison* 802. Gilgit, *Tanner* 205. Kashmir; Bhangsa, *Herb. Falconer* 3359. Above Dras, 3500–3800 m., *Duthie* 13788. Kishiyanga Valley, 3200 m., *Winterbottom* 535. Punjab Himalaya: Lahul, Upper Bhanga Valley, 3100–4300 m., *Stoliczka;* 4300 m., *Herb. J. R. Drummond* 8312; glacier lake, Garugantal, Kulu, *Herb. J. R. Drummond,* 8313. On the way to the Kukti Pass, Chamba, *Watt* 3171 (Herb. Edinb.). Zanscar-tsu, *Watt* (Herb. Edinb.).

Leptopyrum, *Reichb.* Consp. 192 (1828).

Leptopyrum fumarioides, *Reichb.* l.c.; Ic. Fl. Germ. iv. 26, t. cxiii. b. (1839); Spach, Hist. Veg. vii. 328 (1839).

Isopyrum fumarioides, Linn. Sp. Pl. 557 (1753).

Helleborus fumarioides, Lamk. Encycl. iii. 99 (1789).

Isopyrum fumariaefolium, Salisb. in Trans. Linn. Soc. viii. 306 (1807).

Eastern Asia: In mountain places from the Altai to Amur, South to Kansu; naturalised in parts of Europe.

Fig. 3.—Leptopyrum fumarioides (nat. size, dissections and fruits enlarged).

Enemion, *Rafin.* in Journ. Phys. xci. 70 (1820).

§I. Euenemion, *nobis.*—Flores solitarii.

Carpella stipitata; stamina circiter 10 ... 1. *E. stipitatum.*

Carpella haud stipitata:

Carpella plurisperma (usque ad 6); semina granulata ... ... 2. *E. occidentale.*

Carpella 1–2-sperma; stamina numerosa; semina laevia ... ... 3. *E. biternatum.*

§II. Umbellata, *nobis.*—Flores umbellati.

Petioli petiolulis multo breviores; sepala basin versus angustata; umbellum simplex; Asia bor. or. ... ... 4. *E. Raddeanum.*

Petioli petiolulis aequilongi vel longiores; sepala basi lata; umbellum compositum, umbellulis bracteatis; Am. bor. occid. ... ... 5. *E. Hallii.*

1. **Enemion stipitatum,** *nobis*, comb. nov.

Isopyrum stipitatum, A. Gray in Proc. Am. Acad. xii. 54 (1876).

N. America. N. California, *E. L. Greene.*

2. **Enemion occidentale,** *nobis*, comb. nov.

Isopyrum occidentale, Hook. et Arn. Bot. Beech. Voy. 316 (1841); Torr. et Gray, Fl. N. Am. i. 660 (1840); Brewer and Wats. Bot. of Calif. i. 9 (1876); Jeph. Fl. W. Midd. Calif. 194 (1901).

N. America. California, without definite locality, *Douglas.* Near Forest Hill, Placer Co., among bushes in loose light soil, Apr. 12, 1865, *H. N. Bolander* 4553. Mariposa, *Congdon.* Coast Ranges: Weldon Canon, Vaca Mts., Mar.–Apr., *Jephson.* Amador County, 940 m., *G. Hansen* 737. Mt. Hamilton Range, *Heller* 8934. San Benito, *Elmer* 4900.

var. **coloratum,** *nobis.* Flowers red. *I. occidentale*, var. *coloratum*, Greene in Erythea, i. 125 (1893).

California: Santa Cruz Mts., Fremont's Peak, Mar.–Apr. 1893, *L. W. Cushman* (not seen).

3. **Enemion biternatum,** *Raf.* in Journ. Phys. xci. 70 (1820).

Isopyrum biternatum, Torr. et Gray, Fl. N. Am. i. 660 (1840). Britt. et Br. Ill. Fl. N. States and Canada, ii. 89, fig. 1860 (1913).

E. N. America. In moist woods and thickets, Ontario to Minnesota, Kansas, Florida and Texas (fide Britt. & Br. l.c.).

Fig. 4.—A. Enemion biternatum. B. Enemion Raddeanum (½ nat. size, dissections enlarged).

4. **Enemion Raddeanum,** *Regel* in Bull. Soc. Nat. Mosc. xxxiv. ii. 61, tab. ii. fig. 3, 4, f.g. (1861).

Isopyrum Raddeanum, Maxim, Mél. Biol. xi. 639 (1883).

Manchuria. Moukden to Yalu River, at Laoling, *Rev. J. Webster* 130. Li Fudin river, 1860, *Maximowicz.* In moist woods, Srednija Valley, Amur river, 28 May 1895, *Komarov* 661 (Herb. Kew). Bureia river mountains, *Radde.*

Corea. Musang district, 23 May, 1897, *Komarov* 661 (Herb. Mus. Brit.). A variety *japonica* is recorded by Franchet (Enum. Pl. Savat. ii. 271). We have not seen any Japanese specimens.

5. **Enemion Hallii,** *nobis*, comb. nov.
Isopyrum Hallii, A. Gray in Proc. Amer. Acad. vii. 374 (1872).
N. America. Oregon: without precise locality, 1871, *Elihu Hall* 10 (type).

Isopyrum, *Linn.* (emend.).

Petali unguis limbo multo brevior; species europea ... ... 1. *I. thalictroides.*
Petali unguis limbo longior; species asiaticae:
Torus demum tumescens et circa summum pedicellum in forma coni truncati excavati deflexus:
Semina laevia nitidaque:
Petali limbus integer ... . 2. *I. stoloniferum.*
Petali limbus emarginatus ... ... 3. *I. nipponicum.*
Petali limbus oblique bilabiatus ... 4. *I. dicarpon.*
Semina muricata vel tuberculata (fig. 5 c):
Petali limbus stipite sua 1–2 plo brevior; semina laxe tuberculata 5. *I. trachyspermum.*
Petali limbus stipitem suam aequans; semina dense muricata ... ... 6. *I. Fauriei.*
Torus haud tumescens:
Semina laevia nitidaque, plus minusve globosa:
Foliolum terminale lanceolato-ellipticum, circiter medium latissimum (fig. 6 A):
Inflorescentia subscaposa ... 7. *I. Dalzielii.*
Inflorescentia foliosa ... ... 8. *I. auriculatum.*
Foliolum terminale plus minusve obovato-orbiculare, supra medium latissimum (figs. 6 B, c):
Petali limbus integer ... ... 9. *I. Franchetii.*
Petali limbus emarginatus:
Foliolum terminale ut in fig. 6 B 10. *I. sutchuenense.*
Foliolum terminale ut in fig. 6 c 11. *I. adiantifolium.*
Semina reticulata, utrinque acuta (fig. 5 B) ... ... 12. *I. Fargesii.*

1. **Isopyrum thalictroides,** *Linn.* Sp. Pl. i. 557 (1753); DC. Prodr. i. 48; Maxim. in Bull. Acad. Sci. St. Petersb. xi. 631 (1883). *Helleborus thalictroides*, Lam. Fl. Fr. iii. 315 (1778). *Fontanella tertiaria*, Pluk. ex. Bers. Prim. Fl. Gal. ii. 363 (1808). *Gontarella tertiaria*, Gilib. ex Steud. Nom. ed. i. 380 (1821). *Olfa thalictrifolia*, Bub. Fl. Pyren. iii. 378 (1901).

EUROPE. Mountains from the Pyrenees to the Ardennes and to Warsaw, south to the Abruzzi, Albania and the Northern Balkans.

Fig. 5.—**A,** ISOPYRUM THALICTROIDES, *Linn.*; **A1**, the Italian form with up to four carpels. **B,** I. FARGESII. **C,** I. TRACHYSPERMUM.

2. **Isopyrum stoloniferum,** *Maxim.* in Bull. Acad. Sci. St. Petersb. xi. 636 (1883); Franch. in Journ. de Bot. xi. 222 (1897); Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 405 (1904).

Isopyrum dicarpon, Franch. et Savat. Enum. i. 11, ii. 271, non Miq.

JAPAN. Nippon: Senano Province, *Tschonoski!* Fudziyama woods, *Tschonoski* (type). Mt. Fuzi, Suruga Province, July 26, 1881, *Sci. Coll. Herb.* (Japan); *Sakurai* (Herb. Edinb.); *Takeda* (Herb. Edinb.).

3. **Isopyrum nipponicum,** *Franch.* in Bull. Soc. Bot. Fr. xxvi. 82 (1879); Maxim. in Bull. Acad. Sci. St. Petersb. xi. 631 (1883); Franch. in Journ. de Bot. xi. 220 (1897); Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 407 (1904).

JAPAN. Nippon: Etchigo Province, moist rocks near the Nitsu waterfall, *Faurie* 619 (fide Franch.). Kanasava Mountain, *Faurie* 7951. West of Shimidzutage, *Faurie* 2585 (fide Franch.).

We have seen only a rather fragmentary specimen of this species, which is not readily separated from *I. dicarpon* except by the form of the petals.

4. **Isopyrum dicarpon,** *Miq.* Prol. 195 (1867); Maxim. in Bull. Acad. Sci. St. Petersb. xi. 635 (1883); Franch. in Journ. de Bot. xi. 221 (1897); Finet and Gagnep. Bull. Soc. Bot. Fr. li. 407 (1904). *Isopyrum stipulaceum,* Franch et Savat. Enum. Pl. Jap. ii. 270 (1874), fide Maxim. l.c.

Japan. Nagasaki: Koisiwara, in woods, 1863, *Maximowicz.* Idu Province; Mt. Amagi, June 12, 1883, *Sci. Coll. Herb.* (Japan). Kiusiu, *Savatier* (fide Franch.).

5. **Isopyrum trachyspermum,** *Maxim.* in Bull. Acad. Sci. St. Petersb. xi. 636 (1883); Franch. in Journ. de Bot. xi. 219 (1897). *Isopyrum dicarpon,* S. Moore in Journ. Bot. 1878, 129, non Miq.

Japan. Mountains of Nikko and Oyama, *Bisset* 964. Miogi-san, *Bisset* 3653 (Herb. Edinb.). Hakone, *Bisset* 3876 (Herb. Edinb.). Chichibu, Unsashi Province, *Sci. Coll. Herb.* (Japan). Woods at Tsukubasan, Hitachi Province, *Takeda.* Mt. Tanzawa, *Sakurai* (Herb. Edinb.).

6. **Isopyrum Fauriei,** *Franch.* in Journ. de Bot. xi. 218 (1897); Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 406 (1904).

Japan. Nippon: Senano Province, near Asama-Yama, May 1892, *Faurie* 8018.

We have not, unfortunately, seen a specimen of this species and we have relied in our key on the characters given by Franchet (l.c.). It may be a form of *I. trachyspermum,* Maxim., which was omitted from their revision of the genus by Finet and Gagnepain.

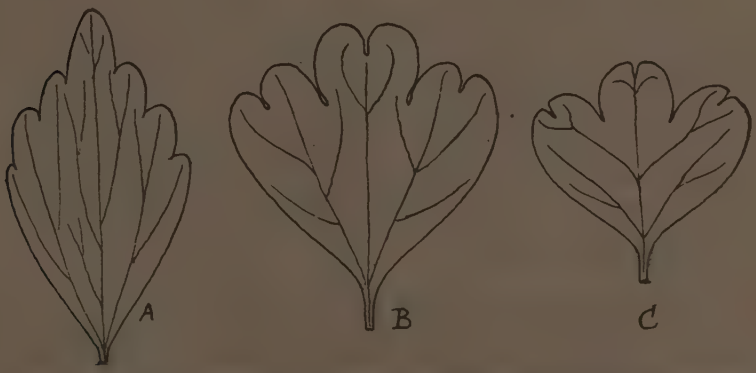


Fig. 6.—Terminal leaflets of **A,** Isopyrum auriculatum; **B,** I. sutchuenense; **C,** I. adiantifolium (**B** and **C** enlarged).

7. **Isopyrum Dalzielii,** *nobis,* sp. nov.

Herba bispithamea, radice fibrosa. *Folia* omnia radicalia, petiolis basi abrupte auriculatis supra profunde canaliculatis glabris usque ad 3 cm. longis suffulta, pedatim vel digitatim ternata vel rarius abortu biloba, circiter 4 cm. extensa, segmentis ovato-rhomboideis basi breviter cuneatis apice obtusis

vel emarginatis irregulariter crenulatis glabris infra glaucescentibus, petiolulis teneris terminale usque ad 5 mm. longo. *Inflorescentia* efoliata, laxe cymosa, ramis subcapillaribus, bracteis trisectis ad 4 mm. extensis munita; pedicelli ultimi bibracteolati, usque ad 3·5 cm. longi. *Sepala* ovata, obtuse acuminata, fere 1 cm. longa. *Petala* sepalis dimidio breviora, spathulata, apice bifida. *Carpella* duo, ensiformia, circiter 1 cm. longa, demum divergentia et chartacea, in stylum persistentem stramineum tenuem producta. *Semina* laevia, castanea, nitentia, late ovoidea, quasi carinata.

China. Kwangtung: Wu-king-fu, about 60 miles west of Swatow, *J. M. Dalziel* (Herb. Edinb.).

8. **Isopyrum auriculatum,** *Franch.* Pl. Delavay. 23, t. 6 (1889); Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 405 (1904). *Isopyrum Delavayi*, Franch. in Journ. de Bot. xi. 222 (1897).

China. Szechuan: Mt. Omi, *E. H. Wilson* (Veitch Exped.) 4699; without locality, *E. H. Wilson* (Veitch Exped.) 3087. Western Hupeh: *E. H. Wilson* (Veitch Exped.) 2672. Tchen-fong-chan, June 1894, *Delavay* 4920 bis. Longki, *Delavay* 4951.

9. **Isopyrum Franchetii,** *Finet et Gagnep.* in Bull. Soc. Bot. Fr. li. 405 (1904). *Isopyrum auriculatum*, Franch. in Journ. de Bot. xi. 220 (1897), non in Pl. Delav. lc.

China. Yunnan: mountain woods of Long-ki, Apr. 1894, *Delavay* 5094! (type). Hupeh: South Patung, *A. Henry* 5374! without locality, *A. Henry* 5252! Kweichow: Pinsa, *Cavaleric* (Herb. Edin.).

10. **Isopyrum sutchuenense,** *Franch.* in Journ de Bot. viii. 274 (1894); Franch. l.c. xi. 219 (1897). *I. adiantifolium*, Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 406 (1904), partim, non Hook. f. and Thoms. *Isopyrum adiantifolium*, var. *arisanensis*, Hayata in Journ. Coll. Sc. Tokyo, xxx. 21 (1911).

China. Szechuan: Tchen-keou-tin district, 2000 m., May, *Farges* 794. South Wushan, *A. Henry* 5558. Western Hupeh: without definite locality, *E. H. Wilson* (Veitch Exped.) 258. 518. Patung, *E. H. Wilson* (Veitch Exped.) 448. Kweichow? *Esquirol* 432. Formosa: Arisan, 2500 m., *Kawakami & Mori*, 578* (Herb. Mus. Brit.).

11. **Isopyrum adiantifolium,** *Hook. f. et T. Thoms.* Fl. Ind. i. 42 (1855); Fl. Brit. Ind. i. 23 (1875); Maxim. in Bull. Acad. Sci. St. Petersb. xi. 634 (1883); Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 406 (1904), partim.

India. Sikkim: Pachim, 2150 m., *Hooker and Thomson;* Darjeeling, *T. Thomson; Griffith; Treutler* 72; Tonglo, 2400 m., June 4, 1884, *C. B. Clarke*, 25641, 35899; *Lacaita* 15719; Rungvroong, Sept. 7, 1869, 1950 m., *C. B. Clarke* 9118; Dikeeling, 2400 m., May 11, 1876, *C. B. Clarke* 27870; On the way to Sandukfu, *Watt* 5359 (Herb. Edinb.). Upper Burma: Lashi

* This Formosan specimen does not show the number of the stamens which are stated by Hayata to be five in number.

country; Htawgau, valley of Naung-chaung, 2220–2250 m., *Kingdon-Ward* 1601 (Herb. Edinb.).

12. **Isopyrum Fargesii,** *Franch.* in Journ. de Bot. xi. 194 (1897); Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 405 (1904).

China. Szechuan: near Tchen-keou-tin, *Farges* (type). Hupeh: *A. Henry* 5558 A. Kweichow: Pinsa, *Cavalerie* (Herb. Edinb.). Gaupin, *Cavalerie* 2109 (Herb. Edinb.).

Semiaquilegia, *Makino* in Jap. Bot. Mag. xvi. 119 (1902).

Flores parvi, circiter 5 mm. longi; carpella glabra; species japonica ...	1. *S. adoxoides.*
Flores satis magni, circiter 1–1·5 cm. longi; carpella pubescentia:	
Folia triternata; Am. bor.	2. *S. Eastwoodiae.*
Folia biternata; sp. asiatica	3. *S. simulatrix.*
Folia trifoliolata; sp. asiatica ...	4. *S. Henryi.*

1. **Semiaquilegia adoxoides,** Makino, l.c.

Isopyrum adoxoides, DC. Syst. i. 324 (1818). *I. capnoides* Fisch. ex DC. Prodr. i. 48 (1852). *I. japonicum,* Sieb. & Zucc. in Abh. Akad. Muench. iv. ii. 181 (1848).

China. Szechuan: Keou-pa-tana, *Delavay* 18. Kweichow: Pinsa, *Cavalerie* 1344. Kouy-yang, *Bodinier* 2110. Hupeh: Ichang, *A. Henry* 1253 a; without definite locality, *E. H. Wilson* (Veitch Exped.) 151. Kiangsi: Nankangfu, covering the ground in many parts, Apr., *K. D. Reid.* Kiukiang city wall, *Carles* (Herb. Edinb.). Chekiang: *Shearer; Faber* 714; shady and dry waste ground, Mar.-Apr., *H. J. Hickin.* "Chekiang and R. Yangtze," *Maries.* Ningpo, generally in deep shady glens or hill gorges, April. 1877, *W. Hancock* 30; *Schindler* 459 (Herb. Edinb.). Shanghai, *Bodinier* 305.

Japan. Tokyo, *Sakurai* (Herb. Edinb.). Oyama, *Bisset* 1382 (Herb. Edinb.). Nagasaki, *Langsdorff* (Herb. Fischer); *Oldham* 15; on old walls and banks, 500; *Maximowicz; A. C. Maingay* 826. Yokoska, *Savatier* 12. Near Kobe, Apr. 1875, *Moseley:*— for further Japanese records see Makino l.c.

Corea. Quelpaert Island, *Taquet* 510, 507, 2569, 4548, 4806, 4807, 4808, 6048; *Faurie* 1724.

Japanese name—*Hime-udu.*

2. **Semiaquilegia Eastwoodiae,*** *nobis,* comb. nov.

Aquilegia micrantha mancosana, Eastw. in Proc. Calif. Acad. iii. i. 77 (1897). *Aquilegia micrantha ecalcarata,* Davis in Minn. Bot. Stud. ii. 336 (1899). *Aquilegia Eastwoodiae,* Rydb. in Bull. Torr. Bot. Club, xxix. 146 (1902). *Aquilegia ecalcarata,* Eastw. in Zoe, ii. 226 (1891); Payson in Contrib. U.S. Nat. Herb. xx.

* This and the next may be as Payson (l.c.) inclines to suggest aberrant forms of *Aquilegia,* but pending further evidence we assume them to be primitive and have placed them in *Semiaquilegia,* to which on the characters they must be referred. Ulbrich's alternative solution to put *S. Henryi* under *Aquilegia* hardly commends itself.

153 (1918). *Aquilegia mancosana*, Cockerell in Torreya, xi. 75 (1911).

North America. Colorado: Johnston Canyon, Mesa Verde National Park, *Eastwood*.

"Miss Eastwood collected this interesting plant in but one niche-like cavern, where the sun never comes and where the supply of water is so slight during the hot, dry summer that it is forced to cling close to the damp rocks, even climbing up the sides of the cave with its slender, threadlike stems."—Payson, l.c. We have not seen a specimen.

3. **Semiaquilegia simulatrix,** *nobis*, nom. nov.

Aquilegia ecalcarata, Maxim. Fl. Tangut. 20, t. 8, fig. 12. (1889); Finet et Gagnep. in Bull. Soc. Bot. Fr. li. 411 (1904); non Hort. ex Steud., nec Eastwood.

China. Eastern Kansu, *Przewalski, Potanin; Farrer* 280 (spec. cult. by *Mrs. Woodward*, Arley Castle). Szechuan: near Tatsienlu, *Soulié; Bonvalot*.

Fig. 7. Semiaquilegia Henryi. (Nat. size; dissections and fruit enlarged.)

4. **Semiaquilegia Henryi,** *nobis*, comb. nov.

Isopyrum Henryi, Oliv. in Hook. Ic. Pl. t. 1745 (1888). *Anemone Boissiaei*, Lev. et Vaniot in Bull. Acad. Geogr. Bot. 1902, 47. *Aquilegia Henryi*, Finet et Gagnep. in Bull. Soc. Bot.

Fr. li. 411 (1904). *Isopyrum Boissieui*, Ulbr. in Engl. Bot. Jahrb. xxxvi. Beibl. 80, 6 (1905).

China. Hupeh: Nanto and neighbouring mountains, growing out of clefts of rocky cliffs, flower bluish, *A. Henry* 3820. Kweichow: between Tsin-chen and Ganpin, Mar. 17, 1898, *Martin & Bodinier* 2120. Pinsa, *Cavalerie* 864. Chwang Chanpo, *Esquirol* 3145. Szechuan: Tchen-keou district, *Farges*.

Souliea, *Franch.*

Souliea vaginata, *Franch.*, in Journ. de Bot. xii. 69 (1898). *Isopyrum vaginatum*, Maxim. Fl. Tangut. 18, t. 30 (1889).

China. Thibet: Jhangkar Chu valley and up to the Jhangkar Pass, end of May, 1914, *E. H. Walsh* 104. W. Kansu: 1885, *G. N. Potanin*. Szechuan: "chiefly near Tachienlu," *A. E. Pratt* 881; without definite locality, 3000–3450 m., fls. pink, May 1904, *E. H. Wilson* 3171. Yunnan: Santchao, near Moso-yn, *Delavay* 3716.

Fig. 8. Souliea vaginata. (× ¾); dissections enlarged.

The broad sheathing base of the lower petioles is a striking feature of this distinct monotypic genus. In many respects it

appears to provide a definite link between the subtribes *Isopyreae* and *Cimicifugeae*, its correct position being next to *Cimicifuga*. Its fruits (fig. 8) recall those of some species of *Epimedium*, whose dehiscence, however, is by two oblique valves and not by the adaxial (ventral) suture as in *Souliea* and all other dehiscent *Ranunculaceae*.

INDEX TO NAMES AND SYNONYMS DEALT WITH ABOVE.

Anemone Boissiaei, Lev. & Van. = **Semiaquilegia Henryi.**
Aquilegia anemonoides, Willd. = **Paraquilegia grandiflora.**
A. Eastwoodiae, Rydb. = **Semiaquilegia Eastwoodiae.**
A. ecalcarata, Maxim. (non Steud. nec Eastw.) = **Semiaquilegia simulatrix.**
A. ecalcarata, Eastw. = **Semiaquilegia Eastwoodiae.**
A. Henryi, Finet & Gagnep. = **Semiaquilegia Henryi.**
A. micrantha, vars. *mancosana*, Eastw. & *ecalcarata*, Davis = **Semiaquilegia Eastwoodiae.**
Asteropyrum Cavaleriei, *nobis.*
A. peltatum, *nobis.*
Enemion biternatum, *Rafin.*
E. Hallii, *nobis.*
E. occidentale, *nobis.*
E. Raddeanum, *Regel.*
E. stipitatum, *nobis.*
Fontanella tertiaria, Kluk. ex Bess. = **Isopyrum thalictroides.**
Gontarella tertiaria, Gilib. ex Steud. = **Isopyrum thalictroides.**
Helleborus fumarioides, Lamarck = **Leptopyrum fumarioides.**
H. thalictroides, Lamarck = **Isopyrum thalictroides.**
Isopyrum adiantifolium, *Hook. fil. & Thoms.*
I. adoxoides, DC. = **Semiaquilegia adoxoides.**
I. adoxoides, Fr. et Sav. = **Isopyrum nipponicum.**
I. album, Dulac = **Isopyrum thalictroides.**
I. anemonoides, Kar. & Kir. = **Paraquilegia uniflora.**
I. aquilegioides, Linn. (see "nomina excludenda").
I. auriculatum, Franch. in Bull Soc. Bot. Fr. xxxiii. 376 (1886).
I. auriculatum, Franch. in Journ. de Bot. xi. 220 = **Isopyrum Franchetti.**
I. biternatum, Torr & Gray = **Enemion biternatum.**
I. Boissieui, Ulb. = **Paraquilegia Henryi.**
I. caespitosum, Boiss. & Hohen. = **Paraquilegia caespitosa.**
I. capnoides, Fisch. ex DC. = **Semiaquilegia adoxoides.**
I. Cavaleriei, Lev. & Vaniot = **Asteropyrum Cavaleriei.**
I. Clarkii, Kellog. = **Enemion stipitatum.**
I. Dalzielii, *nobis.*
I. Delavayi, Fr. = **Isopyrum auriculatum**, Fr.
I. dicarpon, Miquel.
I. dicarpon, Franch. et Sav. = **Isopyrum stoloniferum.**
I. dicarpon, S. Moore = **Isopyrum trachyspermum.**
I. Fargesii, Franch.
I. Fauriei, Franch.

I. Franchetii, Finet & Gagnep.
I. fumariaefolium, Salisb. = **Leptopyrum fumarioides.**
I. fumarioides, Linn. = **Leptopyrum fumarioides.**
I. grandiflorum, Fisch. ex DC. = **Paraquilegia grandiflora.**
I. grandiflorum, Les. ex Nakai = **Enemion Raddeanum.**
I. Hallii, A. Gray = **Enemion Hallii.**
I. Henryi, Oliv. = **Semiaquilegia Henryi.**
I. japonicum, Sieb. & Zucc. = **Semiaquilegia adoxoides.**
I. Leveilleanum, Nakai = **Enemion Raddeanum.**
I. microphyllum, Royle = **Paraquilegia microphylla.**
I. nipponicum, *Franch.*
I. occidentale, Hk. et Arn. = **Enemion occidentale.**
I. peltatum, Franch. = **Asteropyrum peltatum.**
I. Raddeanum, Maxim. = **Enemion Raddeanum.**
I. sibiricum, Krashym. = **Leptopyrum fumarioides.**
I. stipitatum, A. Gray = **Enemion stipitatum.**
I. stipulaceum, Fr. et Savat. = **Isopyrum dicarpon.**
I. stoloniferum, *Maxim.*
I. sutchuenense, *Franch.*
I. thalictrifolium, Gilib. = **Isopyrum thalictroides.**
I. thalictrifolium, Salisb. = **Isopyrum thalictroides.**
I. thalictroides, *Linn.*
I. thalictroides, Short = **Enemion biternatum.**
I. thalictroideum, St. Leger = **Isopyrum thalictroides.**
I. trachyspermum, *Maxim.*
I. tuberosum, Lev. = **Semiaquilegia adoxoides.**
I. uniflorum, Aitch. & Hemsl. = **Paraquilegia uniflora.**
I. vaginatum, Maxim = **Souliea vaginata.**
Leptopyrum fumarioides, *Reichb.*
Olfa thalictrifolia, Bieb. = **Isopyrum thalictroides.**
Paraquilegia caespitosa, *nobis.*
P. grandiflora, *nobis.*
P. microphylla, *nobis.*
P. uniflora, *nobis.*
Semiaquilegia adoxoides, *Makino.*
S. Eastwoodiae, *nobis.*
S. Henryi, *nobis.*
S. simulatrix, *nobis.*
Souliea vaginata, *Franch.*

Excluded Names.

Isopyrum aquilegioides, Bory & Chaub. = **Thalictrum orientale.**
Isopyrum aquilegioides, Linn. = **Aquilegia viscosa.**
I. semipeltatum, Pampan. = **Thalictrum ichangense.**
I. trichophyllum, Lev. = **Thalictrum foeniculaceum.**
I. trifolium, Britton = **Coptis trifolia.**

XXIV.—TRESCO ABBEY GARDENS, SCILLY ISLES.

One of the functions of the Royal Botanic Gardens, Kew, as is well known, is to grow as far as possible the plants representative not only of the British Empire, but also of the world. For the most part these plants have to be grown under glass, and though even under these conditions many exhibit fairly well their natural pecularities of form and their general characteristics, especially when they come from the tropical regions, yet the plants from the subtropical countries, which are not hardy in the open, cannot as a rule be cultvated to show their true value and beauty under glass.

It is the incomparable advantage of botanists and gardeners of Great Britain that they are able to study such plants, native of South Africa, New Zealand, Australia and South America in the two famous gardens of Tresco Abbey in the Scilly Isles and La Mortola in the Riviera.

These two splendid collections of plants, formed by the enterprise and enthusiasm of two remarkable Englishmen, Augustus Smith and Sir Thomas Hanbury, are perhaps not sufficiently known to the botanists and gardeners of the present generation.

British botanists tend to be concerned so much with problems of structure and function that they have but little leisure or inclination to investigate the interesting general features of the vegetation of the Empire, while those whose function it is to deal with the systematic side of the science are so fully occupied that they have but little time left to study as living organisms the plants with which they are so familiar as dried specimens in the herbarium.

This, however, is an omission that is not wholly their own fault, and it would be highly desirable if arrangements could be made so that systematic botanists, more particularly, should pay visits to these two magnificent collections, from time to time, in order to study in the living condition the plants with which their sphere of work has made them familiar, though only as inanimate objects.

A twofold benefit could not fail to be realised by such visits, for, in the first place, the knowledge of the plants as living organisms growing in the open under conditions closely comparable to those of their native countries would teach much of their structure and functions, and possibly also of their powers of variation and adaptation, while in the second place these experts in botanical nomenclature would be able to assist the owners of the collections in maintaining and ensuring the correct naming of their plants. In addition they would without doubt be able to suggest new and interesting subjects for experimental cultivation.

So extensive are the collections both at Tresco Abbey and in the gardens at La Mortola that they offer abundant scope for a permanent botanist and a botanical laboratory, but such a counsel of perfection is obviously beyond the range of a private individual, who has to be busied with the cares of maintenance of his collection in addition to his other duties, and it should rather be considered a duty of the State to provide funds for visiting botanists,

who might be on the staff of the National Botanical Institution at Kew, or the Royal Botanic Gardens, Edinburgh, for the purposes of making careful studies of the collections at Tresco Abbey and La Mortola at different times of the year.

In the case of both these institutions, which may be truly styled Botanic Gardens, a complete and accurately named garden herbarium is required, and also as far as possible drawings and studies should be made of the rare and interesting plants as they come into flower.

At La Mortola, we believe, something has already been done in the direction of making a representative collection, but at Tresco, beyond the fact that valuable additions have been made from time to time to enrich the national herbaria at Kew and at Edinburgh, a local garden herbarium has not yet been established.

Tresco, however, is fortunate in possessing a remarkable collection of drawings of a large number of the interesting plants which have flowered in the gardens. The collection was commenced by Mrs. Le Marchant, sister of Mr. Augustus Smith, and a most beautiful and faithful book of her paintings is carefully preserved at the Abbey.

These drawings were made about the middle of the last century, and represent the plants introduced to Tresco by Mr. Augustus Smith. Many of these plants were sent to him from Kew, while for others he was indebted to correspondents in Australia, New Zealand and South Africa. His remarkable botanical enterprise and keen interest in gardening was continued by his nephew, whom he made his heir, Mr. Thomas Algernon Dorrien-Smith. He succeeded to the Lordship of the Islands in 1872, and before then had taken no particular interest in plants or gardens, but he succeeded by determined effort to acquire a full knowledge of the collections and developed a very keen interest in and genuine love of his plants. On his lamented death in 1918 (*K.B.*, 1918, p. 242), he was succeeded by his son. Major A. A. Dorrien-Smith. He has not only inherited his father's and great uncle's botanical tastes and interests, but has done even more signal service to the science of botany in making expeditions to New Zealand and the Chatham Islands, and to Australia in search of seed and plants for the enrichment of the collections at Tresco. In addition, during his service in the South African War he found odd moments for collecting, and sent home many interesting seeds of Aloes, Gladioli, and other plants for the Tresco Gardens.

Just as the mantle of the uncle has descended on nephew and great-nephew so has the mantle of Mrs. Le Marchant fallen on her great-nieces, and the collection of flower studies which she initiated has been skilfully and beautifully continued by the Misses Dorrien-Smith, the sisters of the present Lord Proprietor. Though much has been done by these ladies, many plants still remain to be figured to complete the record of a botanical garden which comprises so remarkable and unique a collection.

The Mesembryanthemums which grow here with all the vigour that they exhibit in their native country have nearly all been faithfully painted, as has also the extensive collection of Pelargoniums, most of which flourish here in the open and flower almost

throughout the entire year. One species indeed, *P. tomentosum*, grows with such remarkable vigour that it even kills out the common bramble by suffocation!

Something must now be said of the Abbey Gardens as they are at the present day. Augustus Smith was quick to realise that without shelter it was possible to grow very little of interest on a wind-swept spot like Tresco, and when he became Lord Proprietor in the year 1833 he started the planting up of shelter belts of *Pinus insignis*, *P. Pinaster*, *Cupressus macrocarpa*, and *Quercus Ilex*, which soon resulted in the formation of sheltered nooks and corners where choicer subjects could be planted. Thanks to this shelter from the frequent gales, exotic trees such as *Hakea oleifolia*, *Cinnamomum camphora*, *Banksias*, *Metrosideros tomentosa*, *M. robusta*, and many others are now fine and stately specimens 30–40 feet high and covered each year with a profusion of bloom.

In addition to the shelter belts and plantations of wind-resisting trees an extensive rock garden was built up and formed partly out of the natural granite rock of the island and in the sheltered bays many a plant unknown to our Northern Hemisphere has found a home and developed with extraordinary vigour.

In such places may be found a great variety of Aloes which bloom each year, such as *A. arborescens* and several other species enumerated in the Tresco plant list, numerous Agaves and a host of Crassulas, Sedums, and Mesembryanthemums, which, indeed, revel in the chinks and crannies of the exposed rocks. Even in March and April the garden is brilliant with masses of *Mesembryanthemum aurantiacum*, *M. Zeyheri*, *M. productum*, and cushions of the beautiful soft pink M. *crassum*, with magnificent spires of *Aloe Salm-Dyckiana* rising above them.

Of shrubs, some of the more noticeable at the time of my visit in April were *Olearia Gunnii*, and *O. stellulata*, *Agonis flexuosa*, *Echium Callithyrsum* from the Canary Islands, *Isopogon latifolius* from Australia with its great head of dull pink flowers, *Dryandra formosa*, bearing numerous golden "cones" of flowers, *Halleria lucida* some 30 ft. high covered with flowers and *Brachyglottis repanda* with large trusses of white flowers. This forms a large shrub, and though the leaves with their silvery lower surface are exposed to the full force of the wind they do not appear to suffer to any extent, and give a fine effect as a bold evergreen shrub. Other interesting trees that deserve notice are *Cinnamomum camphora*, some 30 ft. high, *Clethra arborea*, *Ficus macrophylla*, some 20 ft. high, grown from seed brought home by Major Dorrien-Smith, and several Acacias, of which *A. longifolia* was being cut in considerable quantities for the London market. Nor must *Olearia semidentata* be forgotten, which with *O. chathamica* was just coming into blossom.

Four species of *Coprosma*, *C. lucida*, *C. Baueri*, *C. grandiflora* and *C. robusta* make interesting evergreen trees. They were in full flower, and trees of both sexes of some of the species are to be found in the collection. *C. Baueri* sets seed regularly which germinate freely where they fall.

Some of the most successful hedge plants at Tresco are *Escallonia macrantha* and Veronicas, *Eugenia apiculata*, Correas and various species of *Pittosporum*, and the low hedges made by the first-mentioned shrubs enable more tender plants to be grown in small sheltered enclosures.

The Tresco Abbey Gardens and plantations fall into three very distinct sections:—

1. The garden proper, which includes the rock garden with a southern aspect. Here are considerable outcrops of granite rock, and it becomes very hot and dry during the summer months. It is in this part of the garden that the Mesembryanthemums, Crassulas and Pelargoniums flourish as in their native home, and in addition, Pimelias, Diosmas, Aloes, Cactoid Euphorbias and Puyas grow without trouble, while such bulbous plants as Sparaxis and Freesias become veritable weeds.

2. Then there is all the higher ground above the garden densely planted with *Cupressus macrocarpa* and *Pinus insignis*, amongst which are numerous sheltered bays and enclosures. Here among the predominant gorse and heather are planted the Acacias—several species, including *A. Baileyana*, *A. longifolia*, and *A. verticilliata*, growing and flowering in luxuriance, their only enemy being the wind. Several species of *Melaleuca*, *Leptospermum* and *Hakea* are also making fine bushes. Trees of particular interest which have been planted in these sheltered hollows and are doing well are *Leucadendron argenteum*, the Cape Silver tree, some 10 ft. high, surrounded by gorse, which probably affords it good protection against the wind and also keeps the soil moist, *Widringtonia Whytei*, the Mlanje Cedar, from Nyasaland, *Callitris Sullivani*, from Australia, *Juniperus bermudiana*, the pencil cedar, *Dacrydium cupressoides* and several species of *Podocarpus* and other interesting exotic conifers. Here also an avenue of the Norfolk Island Pine, *Araucaria excelsa*, has been made. On the shady side of the grass drive these trees are making fine growth, but on the more exposed and sunny side they are not a success.

3. The third section of the grounds embraces the northern slope of the central hill, and on this side in bays and clearings among the trees a considerable collection of Himalayan and Chinese Rhododendrons has been brought together. There are several fine specimens of *R. arboreum* and *R. Aucklandii*, but the most striking and interesting species is *R. Veitchianum*, a splendid bush some 7 ft. high and 7 or 8 ft. through, bearing a profusion of its magnificent sweetly-scented white flowers in mid-April. *R. ponticum* occurs throughout this part of the grounds as an undergrowth and makes an excellent wind break near the ground. It has, however, one drawback, since it seeds so freely that its seedlings tend to cover the ground and choke the smaller species unless constant attention is paid to weeding them out.

A word may be said as to other weeds which are prevalent in the Tresco Gardens. In addition to Freesias, Cinerarias come up everywhere, and Bluebells, several species of Oxalis, *Allium triquetrum* and *Nothoscordium* are pests with which it is almost impossible to cope effectively. The latter plant introduced by some

lover of plants as an interesting addition has proved to be a curse from which the gardens can hardly hope ever to be freed.

It is not necessary now to allude to the Scilly Island industries, such as the Daffodils (*K.B.*, 1913, p. 171) and Potato growing for the English and French markets which have been so successfully initiated and fostered by the successive Lord Proprietors, but reference may be made in conclusion to the possibilities of growing New Zealand Flax as a crop for the production of Fibre, not only on Tresco, but in suitable spots on some of the other islands. Phormium is growing remarkably well on Tresco without any particular attention being paid to it, and though there would not be very many acres available for its cultivation in the Scilly Isles it would appear possible to set up a Flax industry in co-operation with growers in Cornwall, and provide a sufficient quantity of leaves to keep a Cornish Flax mill working throughout the year.

As an example of the suitability of the Scillies for Phormium it is of interest to find that plants of *P. Colensoi*, a species, however, which is not of much value for Flax production, has established itself at the foot of the Western Cliffs on St. Martin's just above the reach of the waves. Two large plants may now be seen which have apparently grown from chance seeds and they are fully exposed to the salt spray. They flower profusely and ripen seeds, and young seedlings are springing up in crevices in the granite cliffs above and around the original plants. This naturalization of *P. Colensoi* serves to show that though at first sight the Islands might not be thought suitable for Phormium, owing to the somewhat dry granitic soil, yet the climatic conditions so much resemble those of New Zealand that the cultivation would appear to offer every prospect of success.

It is not the purpose of this brief article on the remarkable collections in the Tresco Abbey Gardens to enumerate the various plants in detail, its object rather is to point out that in the Scilly Islands, thanks to the enterprise and love of plants displayed by the successive Lord Proprietors, we have within the bounds of Great Britain a Botanic Garden of singular importance and value. For in this favoured spot may be studied the principal features, not only of the temperate regions of New Zealand and her outlying islands, of Australia and of South America, but also a vast number of the characteristic features of the subtropical vegetation of South Africa.

The Tresco Gardens have therefore an exceptional claim to be regarded as an Imperial asset of great importance to the botanists of this country whose work lies with the botanical resources of the British Empire, and it is to be hoped that some provision may be made for linking them more closely in the future with the scientific centre maintained by public funds for the purpose of co-ordinating the work of applying botanical knowledge to practical ends.

A. W. HILL.

XXV.—MISCELLANEOUS NOTES.

Sir H. A. Wickham.—We note with pleasure that the honour of knighthood has been conferred on Mr. H. A. Wickham in recognition of his pioneer work in the establishment of the Rubber Industry in the East.

Sir Edmund Giles Loder, Bart.—Kew has lost a valued correspondent of long standing by the death of Sir Edmund Loder at Leonardslee, Horsham, on April 14th. He will be long remembered as the maker of one of the finest English gardens of the present time. His tastes in horticulture were very comprehensive, and although his interest in late years was probably keenest in rhododendrons and conifers, there was scarcely any phase of gardening with which he was not in active sympathy. In his earlier days he took up the cultivation of Alpines and constructed one of the most elaborate rock gardens in the country for their accommodation. Daffodils and hardy fruits had also been amongst his special interests. Sir Edmund, however, was a good deal more than a successful cultivator. He took a keen interest in botanical problems, and his efforts to get his collections correctly named were untiring. He was also a zoologist, hunter and sportsman. As lately as March 29th he was fishing in the River Tay. He was the eldest son of Sir Robert Loder, Bart., and was born in August, 1849. As his only son, Capt. R. E. Loder, of the Royal Sussex Regiment, died in March, 1917, from wounds received at Gaza, Sir Edmund is succeeded in the baronetcy by his grandson.

Dr. George V. Perez.—We regret to announce the death of Dr. G. V. Perez on February 29th at La Quinta, Santa Ursula, Teneriffe.

Dr. George V. Perez was the son of Dr. Victor Perez, of Orotava, Teneriffe, a distinguished physician who took a great interest in agriculture and horticulture in the Canaries, and in whose honour *Micromeria Perezii* was named. After his father's death he edited a memoir on the Canarian fodder plant "Tagasaste" (*Cytisus palmensis*), which had been prepared by Dr. Victor Perez in collaboration with the French botanist Sagot.

Dr. G. V. Perez from time to time contributed to various horticultural and arboricultural journals articles dealing with Canarian botany, forestry and horticulture; among these may be mentioned an account of an interesting system of dry farming practised in the island of Lanzarote (Bull. Soc. Hortic. France, Jan. 1913). It is, however, chiefly as an enthusiastic investigator of the Canarian flora that his name will be remembered. He cultivated numerous rare Canarian plants in his gardens at Puerta Orotava, Villa Orotava and Santa Ursula, and was instrumental in introducing some of them into cultivation in Europe. It was owing to his indefatigable efforts that the long-lost *Statice arborea* was rediscovered on the face of a precipitous cliff, up which it was hauled by ropes to which hooks were attached (Ann.

Bot. xxii. p. 115). He communicated some of his enthusiasm to other botanists, and generously placed at their disposal the material and information which he had collected. Among scientific papers written at his suggestion or based on his work, the following may be mentioned:—The Statices of the Canaries of the Subsection Nobiles (Ann. Bot. xx. pp. 205, 301); Echiums from the Atlantic Islands (*Kew Bull.* 1914, pp. 116, 265); Tagasaste and Gacia (*Kew Bull.* 1918, p. 21); The Rain Tree of Hierro (*Kew Bull.* 1919, p. 153).

He retained his enthusiasm to the date of his death, and one of his last letters to Kew was concerned with his efforts to rediscover *Echium gentianoides*, a Palma species which has only once been collected. His name is commemorated by *Statice Perezii*, *Echium Perezii* (Bot. Mag. t. 8617) and *Cytisus Perezii*.

T. A. S.

William Tyson.—We record with regret the death of Mr. William Tyson, which occurred at Grahamstown on April 14th, 1920. Though born in Jamaica in 1851, Mr. Tyson belongs essentially to South Africa, where for many years he was an ardent plant collector. As early as 1877 he began collecting near Port Elizabeth, and in subsequent years he made extensive additions to his store, both when on tour with the Superintendent of Woods and Forests and during periods of residence in a number of districts. His field included the Karroo, the Cape Peninsula, East Griqualand, Pondoland, and the district round King William's Town. His collection supplied the material for several new species as well as for the genus *Tysonia*. Some hundreds of the East Griqualand and Pondoland specimens are at Kew, while the Herbarium Normale Austro-Africainae was considerably enriched as a result of his efforts. A record of Mr. Tyson's correspondence with Kew reveals his keen interest in the welfare of the Cape, as is shown by his scheme for tree-planting in the Murraysburg district. In latter years he resided at Port Alfred, and specialised in marine algae, his interest in which prompted a recent visit to the Pondoland coast; he hoped also to increase his phanerogamic collection, but ill-health unfortunately hampered his activities.

Thesium brachystylum.—Through inadvertence the name *Thesium fimbriatum*, A. W. Hill, has been assigned to two different species of the genus, one from Nyasaland, described in *K.B.*, 1910, p. 184, and the other from South Africa, described in *K.B.*, 1915, p. 27. These names have also been published in the Flora of Tropical Africa, VI. pt. 1, p. 422, and the Flora Capensis, V. sect. ii. pt. 1, p. 191. The South African plant has therefore been given the name *T. brachystylum*, A. W. Hill, as it is distingushed by possessing a short style, a character which separates the species from its nearest allies. A. W. H.

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